

## VACCINE-INDUCED PROTECTION FROM EGG PRODUCTION LOSSES IN COMMERCIAL TURKEY BREEDER HENS FOLLOWING EXPERIMENTAL CHALLENGE WITH A TRIPLE-REASSORTANT H3N2 AVIAN INFLUENZA VIRUS

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### Study Results

This study provides the first detailed description of the clinical protection afforded to laying turkey hens by vaccination against challenge with a circulating field isolate of a H3N2 triple reassortant avian influenza virus AIV.

### Significance of Study Results

Infections of AIV in turkey breeder hens can cause a decrease in both egg production and quality resulting in significant production losses. In North Carolina in 2003, a triple-reassortant H3N2 AIV containing human, swine, and avian gene segments was isolated from turkey breeder hens. This viral subtype was subsequently isolated from both turkeys and swine in Ohio in 2004, and in Minnesota in 2005, and was responsible for significant turkey production losses. The objective of this study was to determine if currently available commercial, inactivated avian influenza H3 subtype oil emulsion vaccines would protect laying turkey hens from egg production losses following challenge with the 2003 H3N2 field virus isolate from North Carolina (Figures 1–3).

### Additional Information

Interspecies transmission of the influenza viruses has been documented. The segmented nature of the virus genome allows for the reassortment of genes when a susceptible host is co-infected with different influenza virus subtypes. Influenza viruses with novel combinations of gene segments from different influenza susceptible species have been isolated from turkeys. Recently, a H3N2 avian influenza (AI) isolate recovered from turkeys in the U.S. was identified as a triple reassortant containing viral gene segments of human, swine, and avian origin. Because swine possess linked receptors for both avian and mammalian influenza viruses, they are believed to be an example of a host in which genetically reassorted influenza viruses can originate. Co-production of both swine and turkeys on the same farm, as occurs in Minnesota and North Carolina, may increase the opportunity for reassortment between different AI and mammalian influenza viruses due to close contact between these species.

The study results underscore the need to continually match AI vaccine viruses with current field isolates based on genetic analysis. Since these H3N2 viruses appear to have become established in turkey and swine populations, and based on genetic analysis provided in these studies, they are constantly evolving in the field and will likely continue to cause problems in geographic areas of joint dense production. In addition, this study is the first to indicate turkeys, but not chickens, contain the host receptors preferentially used by both avian and mammalian influenza viruses for attachment. Future studies are needed to determine the significance and role of turkeys in the potential for zoonotic spread of avian influenza strains of mixed origin.

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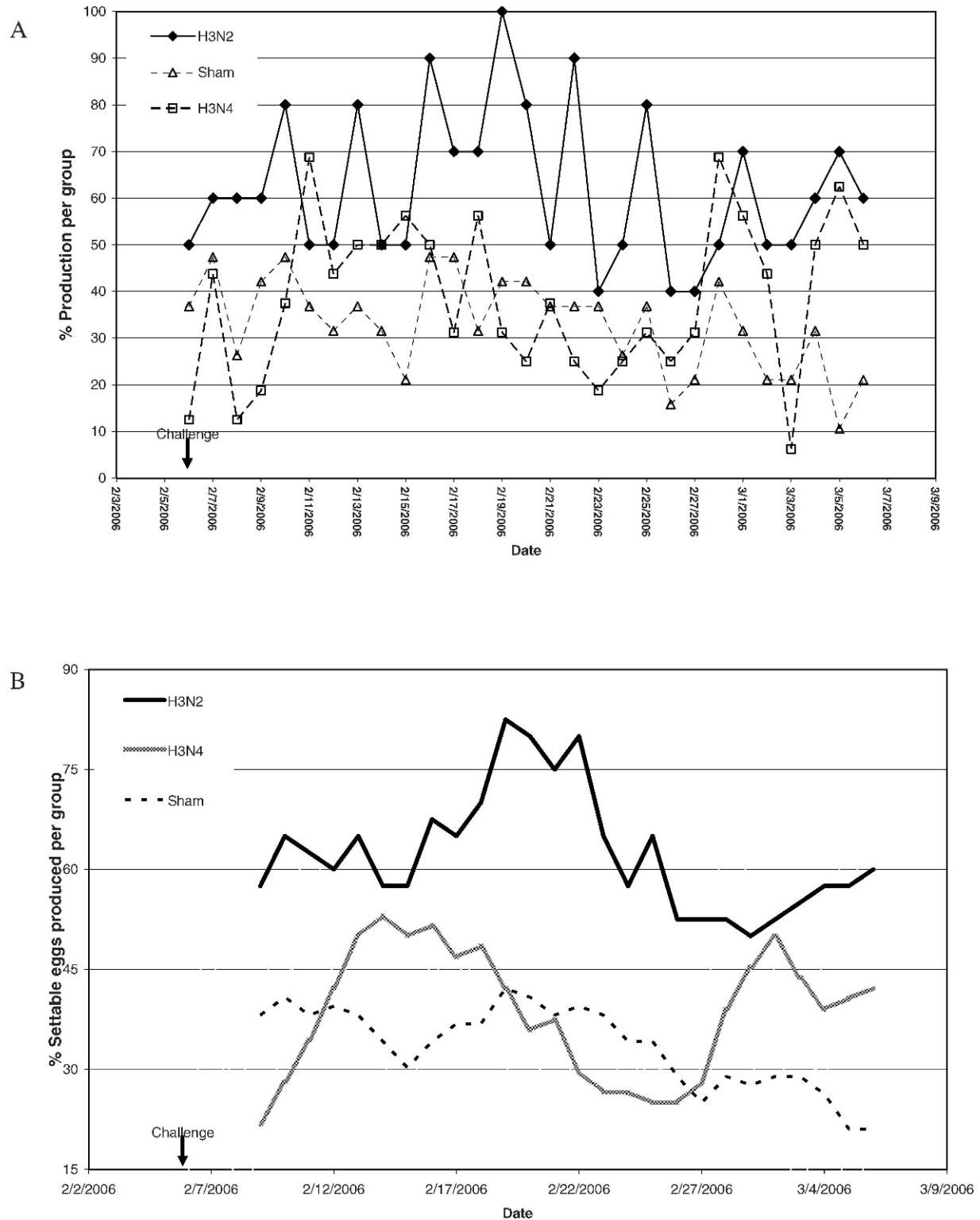


Fig. 1. Production of settable eggs from turkeys following challenge with H3N2 avian influenza. Birds were vaccinated in the field twice with either an inactivated H3N4 vaccine, a bi-valent H3N2–H1N1 vaccine, or sham vaccinated (control). Birds were challenged with  $10^6$  EID<sub>50</sub> H3H2 AI per bird via intranasal/intraocular route. Eggs were harvested twice daily. (A) Daily production of settable eggs per group was determined as total number of eggs recovered/total number of hens per group. (B) Egg production data represented as a moving (rolling) average ( $n = 4$ ).

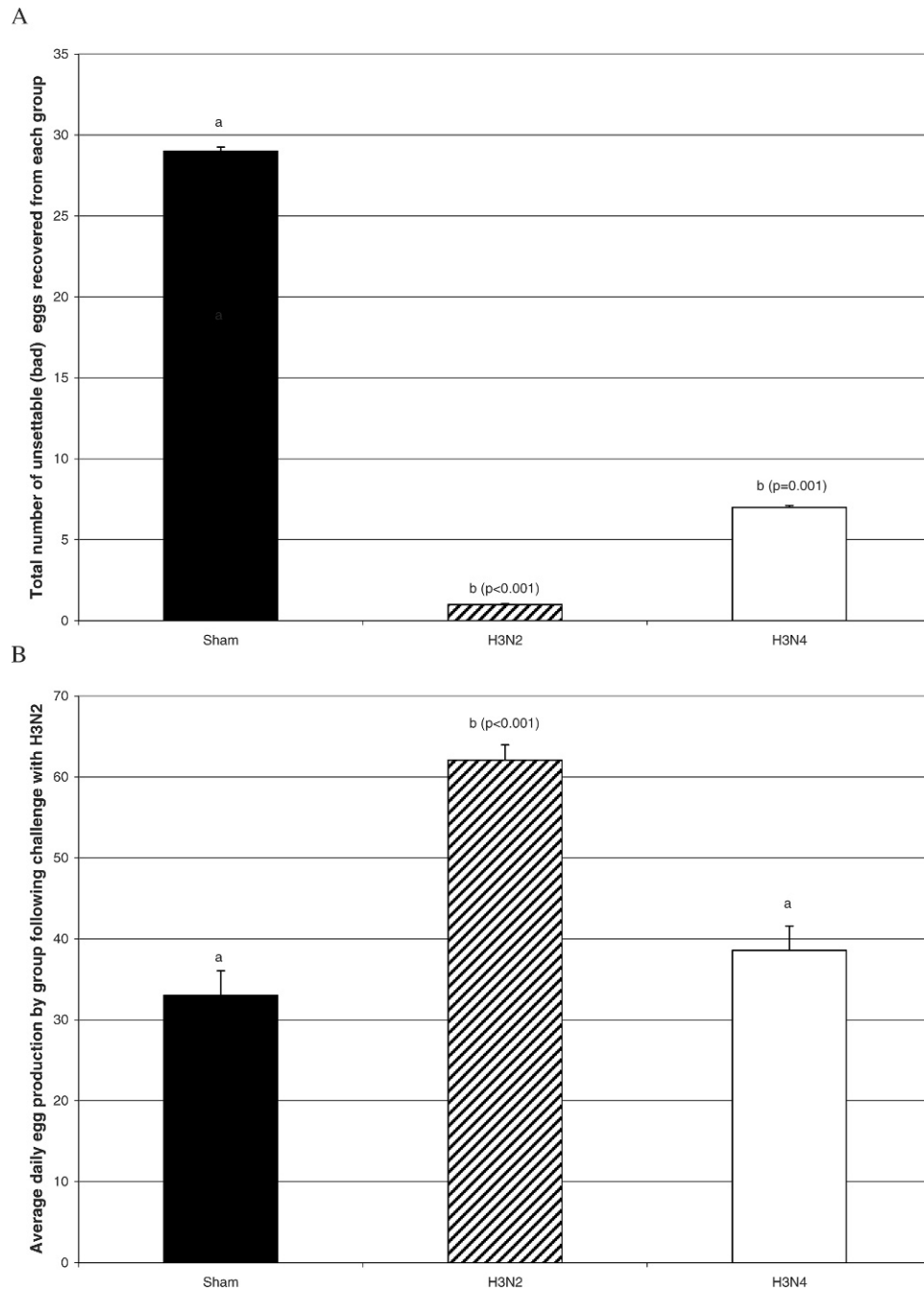


Fig. 2. Egg production in turkey hens following challenge with H3N2 avian influenza. Birds were vaccinated in the field twice with either an inactivated H3N4 vaccine, a bi-valent H3N2–H1N1 vaccine, or sham vaccinated (control). Birds were challenged with  $10^6$  EID<sub>50</sub> H3H2 AI per bird via intranasal/intraocular route. Eggs were harvested twice daily. (A) Total number of unsettable eggs recovered from groups of turkey hens throughout the H3N2 challenge period. (B) Average production per group. Lower case letters indicate a significant difference in mean and standard error between groups as determined with Tukey one-way ANOVA ( $P < 0.05$ ).

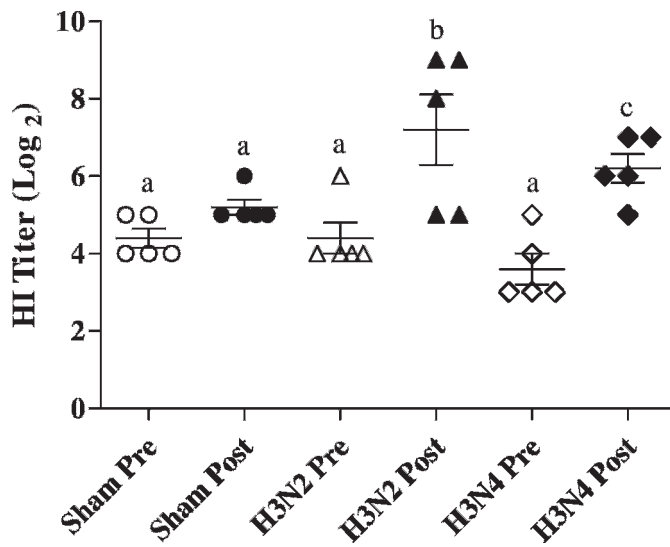


Fig. 3. Serologic response of vaccinated turkey breeder hens following challenge with a turkey origin H3N2 AI isolate, as determined by hemagglutination-inhibition (HI) assay. Birds received two vaccinations at 26 and 30 weeks-of-age and were challenged at 32 weeks-of-age. Birds were challenged with  $10^6$  EID<sub>50</sub> H3N2 AI per bird via intranasal/intraocular route. Serum samples were collected at random from five birds in each group pre- and post-challenge. Results are expressed as log base<sub>2</sub> HI titers against the H3N2 challenge virus. Lower case letters indicate a significant difference in mean and standard error between groups as determined with Tukey one-way ANOVA ( $P > 0.05$ ).